ISSN 2089-9513

Volume 4 Number 1

March 2013

CIVIL ENGINEERING JOURNAL

B3

CIVIL ENGINEERING JOURNAL

Volume 4 - Number 1 – March 2013 **ISSN 2089-9513**

CONTENTS

DOMINANT FACTORS ON INCREASING MATERIAL COST IN CONSTRUCTION PROJECTS

Bambang Endroyo[1], Bambang E. Yuwono[2], and Agung Fajar Martha[3]

ABSTRACT

In construction projects, materials and equipment has an important role whose value could reach up to 50-60% of the total project costs, while supplying the material should reach a value between 25-40% of the project cost. On the other hand, the additional time of ordering, shipping and handling of construction materials might impact the time schedule of the project as well. Quantitatively, the cost of procurement of materials must be 5-10% higher, to cover the loss and the occurrence of rework in the field. However the question that appears – what are the dominant factors that can cause the increase of material cost ?, A questionnaire has been developed and distributed to the construction practitioners in *Jabotabek* (Jakarta, Bogor, Tangerang, Bekasi) to solve the problem. 30 filled questionnaires were analyzed using Analytical Hierarchy Process method. The results are: high levels of competition, the use of waste materials at the site, the quality of material that is not within specifications and increased costs to expedite bureaucracy, are the dominant factors that results the increase in cost of construction materials on project implementation.

Keywords: Construction, Cost, Equipment, Material, Construction practitioners.

I. INTRODUCTION

The era of free market requires an increase in the ability of the companies especially construction companies that are in fierce competition. Therefore, every construction services need to improve the effectiveness of resource management, which led to the success of construction projects, particularly in aspects of time, quality, and cost. In construction projects, materials and equipment has the biggest part of the project, whose value could reach 50-60% of the total project cost (Soeharto, 1995). Procurement of materials on construction projects is the main function of construction activity which value between 25-40% of the project cost. The addition time of ordering, shipping, and handling of construction materials can often have an impact to the procurement of materials becomes a critical activity in a construction project (the Ritz , 1994).

[1] Civil Engineering Department, Semarang State University, Semarang, Indonesia
Email: bbendroyo@yahoo.com
[2] Civil Engineering Department, Trisakti University, Jl. Kyai Tapa, Jakarta, Indonesia
Email: bey_trisakti@yahoo.com
[3] Civil Engineering Department, Trisakti University, Jakarta, Indonesia
Email: jar_kickass@yahoo.com

Material procurement cost control must be carried out efficiently, such as purchase of bulk material, plumbing, and electrical equipment. However, there are 5% to 10% exceed the total cost of procurement of materials that should be used. That must be done to cover the loss and the occurrence of rework in the field. Until now, there is no sufficient information related to what the dominant factors that cause an increase in the cost of the materials used yet. So the question arises: what is the dominant factor in the increased cost of materials in the construction?

II. METHODOLOGY

The methodology that is used in this study are as follows:

a. Identifying the factors suspected as the cause of the increased cost of materials usage by study the literature review. These factors are material resource planning factors, material resource procurement process factors, factors of controlling the implementation process and material resources, and external factors.
b. Arrange a questionnaire to specify the factors suspected as the cause of the increasing the cost of material usage, and details into the variables as indicators to measure these factors, the results can be seen in Table 1. While the parameters used are listed in Table 2 and Table 3
c. Distributing questionnaires to construction practitioners around Jabodetabek, the results are analyzed using the Analytic Hierarchy Process (Analytical Hierarchy Process) was developed by Saaty (1980).

Table 1. Variables used as the basis for the questionnaire

Factor of Causes of Deviation And its Indicators	Reference
A. Factors of Material Resource Planning Process	
a. The errors in estimating and planning a budget for materials cost	Russel & Fayek (1994), Alin (2002), Damayanthy (2008)
b. The Errors in predicting field conditions, weather and upcoming occurrence	Kerzner (1995), Alin (2002), Damayanthy (2008)
c. Preparation of material shipment schedules are less accurate	Ahuja (1976)
d. Specification and drawing are not clear	Clough (1986)
e. Clauses of sub-contract incomplete	Clough (1986)
f. The main contractor too late to give the SPK to sub-contractor	Hinze (1994)
g. The weakness in completion of of disputes between particular parties	Bartholomew (1998)
h. The increased extra costs to expedite bureaucratic	Soeharto (1995)
i. Company policy changes in purchasing material	Ahuja (1976), Alin (2002)
j. Coordination between functions in the organization of project was poor	Febrizal(2002)

B. Factors of Material Procurement Process	
a. Difficulties in procuring materials	Kerzner (1995), Alin (2002)
b. Ordering materials to suppliers done too early before job was started	
c. The quality and quantity of materials purchased not match with the order	Ahuja (1980), Damayanthy (2008)
d. Delay in delivery of materials to the site	Soeharto (1995),Alin(2002), Damayanthy (2008)
e. Changes in material conditions during the delivery process	PMBOK
f. Accessibility during the delivery process is not well	Soeharto(1995),Alin (2002), Damayanthy (2008)
g. Quality of materials that do not fulfill to the specifications	Stukhart (1995), Alin (2002)
h. Deviations of shipping costs	PMBOK
i. The high level of material damage during storage	PMBOK
j. The build up of material at the project site	Ahuja (1980), Alin (2002)
C. Factors of Implementation Process and Resource Materials Control	
a. Errors in applying the standard method of construction to do a job	Russel&Feyek (1994)
b. Wastage of material usage in location	Ahuja (1980), Alin (2002)
c. Material handling are not beware and inadvertent	
d. Rework	Hamzah (1994), Alin (2002)
e. The acceleration of the schedule	Kerzner (1995), Alin (2002)
f. The use of materials and cutting to a form inefficient	Ahuja (1980), Alin (2002)
g. The quality of the installation work is not within specifications	Stukhart (1995)
h. Interventions owner at the implementation stage	Kerzner (1995), Damayanthy (2008)
i. Misapplication of working drawings in the field	Damayanthy (2008)
j. Not following the phasing procedures work	Damayanthy (2008)
k. At least the coordination meetings in the field	Kerzner(1995) Alin (2002)
l. The role of information systems (MIS-IT) is less	Soeharto (1995), Damayanthy (2008)
m. Administration and corporate documentation systems are weak	Kerzner (1995)
n. Evaluation system and decision-making is low	Febrizal (2002), Damayanthy (2008)
o. The control materials at the project site is low	Ahuja (1980), Alin (2002), Damayanthy (2008)
D. External Factors	
a. Loss / theft of material	Alin (2002)
b. Changes in economic condition	Barrie (1993)
c. The things that happen unexpectedly during construct natural disasters, political, etc.	Russel&Feyek (1994), Soeharto (1995)
d. Unfavorable weather conditions	Soeharto (1995)
e. High level of competition	Kerzner (1995)

Each indicator was measured on the frequency of occurrence of the risk and the impact of the level of influence, as shown in Table 2 and Table 3.

Table 2. The parameters used to measure the frequency of occurrence of risk

Value	Description	Scenario	Opportunities
5	Certainly	too often occur	> 85%
4	It may be	a great opportunity occurs	50-85%
3	Quite possibly	not often occur	21-49%
2	Possible Small	little possibility to occur	1-20%
1	Rarely	not expected to occur	<1%

Table 3. The parameters used to influence the level of impact

Value	Description	Explanation
1	None	Has no effect on the increased costs due to the use of material
2	Small	Have little influence on the increase in costs due to the use of material
3	Moderate	Have a moderate effect on the increase in costs due to the use of material
4	Large	Have a major influence on the increase in costs due to the use of material
5	Very large	Definite influence on the increased costs due to the use of material

III. RESULTS AND DISCUSSION

Assessment rating was obtained from the processing the questionnaire data entry using Analytical Hierarchy Process method showed 5 factors that have rank from the top as shown in Table 4.

Table 4. Ranking of the Biggest Risk of The Cause of Deviation Costs Due to Using of Material On Each Factor

Varian	Factor	Name of Variable	Final Score
A8	Material Resource Planning	Increased costs to expedite bureaucratic	46,21
B7	Procurement of Material Resources	Quality of materials that do not conform to the specifications	43,52
C5	Implementation and Control of Material Resources	Wastage of material usage in locations	51,74
D5	External	High level of competition	53,34

The triggers most affect cost deviation for each category, namely:

1. Factors of Material Resource Planning Process, which triggers: the purchase cost, storage cost, cost of waste and use. If there is an error in the planning process, it is necessary to re-purchase materials and rescheduling process.
2. Factors of Process of Procurement of Resource Material, which triggers: a material purchase cost, delivery cost, and quality of the material itself. Purchasing a material with low price and poor quality materials costs will cause the deviation. Non-current material shipment will affect the work activities which directly related to the time and expense.
3. Factors of Implementation Process and Materials Control Resource trigger's is the cost of the purchase, having to buy-back the material due to the low damage and control the use of waste materials in the field.
4. External factors, which trigger the purchase cost. This is because they have to make purchase of the materials due to the influence of external factor that cause damage and waste material. External factor else such as the unstable economy can cause deviation of material cost.

The risk factors that affect the value of major/high influence are:

1. Material Resource Planning Factors
   Variable A8 (46.21%), that is increased costs to expedite bureaucracy. Often to launch a project, the company outsources spend more than the budget that has been set for smooth project.
2. Materials Resource Procurement Factors.
   Variable B7 (43.52%), the quality of materials that does no meet the specifications. Outsources companies often purchase the materials with a relatively cheap price without considering its quality, minimize the budget and increase the profits. This could lead to even greater losses if something unexpected happens. Besides, the error factor of purchase or material damage during shipment or storage of materials that are not good can cause the quality of the does not meet the specifications requirements.
3. Factors of Implementation and Control of Material Resources
   Variables C5 (51.74%), the wastage used materials at the site. Misapplication of material in site causes wastage of material usage, is very harmful because it should re-purchase a material.
4. External factors
   Variable D5 (53.34%), the high level of competition. It is very influential on the deviation of material costs. Due to high competition, many construction companies are tapping the benefits. If an error occurs during the process of planning, procurement, implementation and control of material resources, may be the company could suffer huge loss.

Corrective action is an action that is needed to repair and minimize the cost due to the use of material irregularities in the implementation of construction projects. Necessary

Bartholomew, S. H. (1998). *Construction contracting/Business and legal principles*, N.J.

Clough, R.H. (1986). *Construction controlling*, John Wiley and Sons, New York.

Damayanthy, D. (2008). *Identifikasi Faktor-faktor yang Berpengaruh Terhadap Penyimpangan Biaya Material Rangka Atap Baja Ringan pada PT. X.* Thesis of Bachelor, Civil Engineering.

Febrizal, L. S. (2002). *Rekomendasi Tindakan Koreksi pada Pengendalian Subkonraktor dalam Pengendalian Biaya Proyek dengan Menggunakan Expert System*. Thesis of Magister Program, Faculty of Engineering, University of Indonesia, Depok.

Hamzah, A. (1994). A Perspective of Material Management Practises in a Fast Developing Economy, *Journal of Construction Management and Economics*.

Hinze, J. and Tracey, A. (1994). The Contractor-Subcontractor Relationship: The Subcontractor's View, *Journal of Construction Engineering and Management*,120 (2), pp. 274-287.

Kerzner, H. (1995). *Project Managemen, A System Approach to Planning, Scheduling, and Controlling,* New York, Van Nostrand Reinhold.

PMBOK, P. M. f. C. (2000). *Labor, Material and Equipment Utilization*, http//www.ce.cmu.edu

Ritz, G., J. (1994). *Total Construction Project Management*, McGraw-Hill, Inc.

Russel, A. D. and Fayek, A. (1994). Automated Corrective Action Selection Assistant. *Journal of Construction Engineering and Management*, 120(1), pp. 11-33.

Saaty, T.L. (1980). *The Analytic Hiearchy Process : Planning, Priority Setting ,Resources Allocation*, Mc Graw Hill, London, England.

Soeharto, I. (1995). *Manajemen Proyek dari Konseptual sampai Operasional*. Erlangga, Jakarta.

Stukhart, G. (1995). *Construction Materials Management*, Marcel Dekker, inc, New York.